

WHAT IS CLAIMED IS:

1. An optical pickup device for performing recording and/or reproduction of information by irradiating laser light onto a disk, comprising:

detection means for detecting spherical aberration resulting from a thickness error of an intermediate layer existing between a disk surface and a recording layer; and

correction means for correcting the spherical aberration detected by the detection means,

the detection means including:

a lens designed to converge reflection light from the disk when a thickness of the intermediate layer is greater or smaller than an optimum value by a predetermined degree; and

a photodetector that receives the reflection light converged by the lens to output an electric signal, and when the thickness of the intermediate layer assumes the optimum value, receives a predetermined portion of the reflection light with reference to a total light quantity of the reflection light,

the correction means including a diffusion angle converter that changes a diffusion angle of the laser light traveling toward the disk in accordance with a servo signal generated from the electric signal outputted from the photodetector.

2. An optical pickup device according to claim 1, wherein

the lens is constructed using an aspherical lens that condenses the reflection light at an almost single point when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree.

3. An optical pickup device according to claim 1, wherein the lens is constructed using a spherical lens designed to set spherical aberration of the reflection light to be close to a minimum value when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree.

4. An optical pickup device according to any one of claims 1 to 3, wherein the photodetector is constructed using at least one photosensor, with a shape and arrangement of the photosensor being adjusted to receive around half a total light quantity of the reflection light converged by the lens when the thickness of the intermediate layer assumes the optimum value.

5. An optical pickup device according to any one of claims 1 to 4, wherein the diffusion angle converter is arranged on an optical path extending from a laser light source to the disk, and constructed using at least one lens that changes the diffusion angle of the laser light in accordance with the signal from the photodetector.

6. An optical pickup device according to claim 5, wherein the diffusion angle converter includes a liquid crystal lens that adjusts the diffusion angle of the laser light by changing its own refractive index in accordance with the servo signal.

7. An optical pickup device according to claim 5, wherein the diffusion angle converter includes a lens actuator that adjusts the diffusion angle of the laser light by changing a distance between lenses in accordance with the servo signal.

8. An optical pickup device according to any one of claims 1 to 7, wherein:

one of lens surfaces of the lens is formed to have a spherical or aspherical shape with which the reflection light is condensed when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree, and the other lens surface is formed to have a cylindrical shape with which an astigmatic action is introduced into the reflection light; and

the photodetector includes:

a photosensor portion that receives around half a total light quantity of the reflection light converged by the lens when the thickness of the intermediate layer assumes the optimum value; and

a photosensor portion that has a pair of light-receiving regions arranged in a diagonal line direction and another pair of light-receiving regions arranged in another diagonal line direction, in which when the laser light is appropriately condensed with respect to the recording layer, the reflection light from the disk is uniformly received by the two pairs of light-receiving regions, and when condensing displacement occurs with respect to the recording layer, a quantity of the reflection light received by one of the two pairs of light-receiving regions becomes larger than a quantity of the reflection light received by the other pair of light-receiving regions.

9. A recording and/or reproducing device comprising:

an optical pickup that performs recording and/or reproduction of information by irradiating laser light onto a disk; and

a servo circuit that applies a servo signal to the optical pickup,

the optical pickup including:

detection means for detecting spherical aberration resulting from a thickness error of an intermediate layer existing between a disk surface and a recording layer; and

correction means for correcting the spherical aberration detected by the detection means,

the servo circuit including a drive circuit that drives the

correction means in accordance with a result of the detection by the detection means, wherein:

the detection means includes:

a lens designed to converge reflection light from the disk when a thickness of the intermediate layer is greater or smaller than an optimum value by a predetermined degree; and

a photodetector that receives the reflection light converged by the lens to output an electric signal, and when the thickness of the intermediate layer assumes the optimum value, receives a predetermined portion of the reflection light with reference to a total light quantity of the reflection light;

the drive circuit generates the servo signal for correcting the spherical aberration from the electric signal outputted from the photodetector; and

the correction means includes a diffusion angle converter that changes a diffusion angle of the laser light traveling toward the disk in accordance with the servo signal from the drive circuit.

10. A recording and/or reproducing device according to claim 9, wherein the lens is constructed using an aspherical lens that condenses the reflection light at an almost single point when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree.

11. A recording and/or reproducing device according to claim 9, wherein the lens is constructed using a spherical lens designed to set spherical aberration of the reflection light to be close to a minimum value when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree.

12. A recording and/or reproducing device according to any one of claims 9 to 11, wherein the photodetector is constructed using at least one photosensor, with a shape and arrangement of the photosensor being adjusted to receive around half a total light quantity of the reflection light converged by the lens when the thickness of the intermediate layer assumes the optimum value.

13. A recording and/or reproducing device according to any one of claims 9 to 12, wherein the diffusion angle converter is arranged on an optical path extending from a laser light source to the disk, and constructed using at least one lens that changes the diffusion angle of the laser light in accordance with the signal from the photodetector.

14. A recording and/or reproducing device according to claim 13, wherein the diffusion angle converter includes a liquid crystal lens that adjusts the diffusion angle of the laser light by changing

its own refractive index in accordance with the servo signal.

15. A recording and/or reproducing device according to claim 13, wherein the diffusion angle converter includes a lens actuator that adjusts the diffusion angle of the laser light by changing a distance between lenses in accordance with the servo signal.

16. A recording and/or reproducing device according to any one of claims 9 to 15, wherein:

one of lens surfaces of the lens is formed to have a spherical or aspherical shape with which the reflection light is condensed when the thickness of the intermediate layer is greater or smaller than the optimum value by the predetermined degree, and the other lens surface is formed to have a cylindrical shape with which an astigmatic action is introduced into the reflection light; and

the photodetector includes:

a photosensor portion that receives around half a total light quantity of the reflection light converged by the lens when the thickness of the intermediate layer assumes the optimum value; and

a photosensor portion that has a pair of light-receiving regions arranged in a diagonal line direction and another pair of light-receiving regions arranged in another diagonal line direction, in which when the laser light is appropriately condensed with respect

to the recording layer, the reflection light from the disk is uniformly received by the two pairs of light-receiving regions, and when condensing displacement occurs with respect to the recording layer, a quantity of the reflection light received by one of the two pairs of light-receiving regions becomes larger than a quantity of the reflection light received by the other pair of light-receiving regions.